sum of money for the purpose of testing the truth of the so-called spiritualism.

Since September, the Boston committee has held numerous meetings, and discussed the *pros* and *cons* of the formation of a psychical society, and finally brought forward a constitution under which some eighty gentlemen from different parts of the country have organized themselves. A notice of this meeting was given in No. 100 of *Science;* and in this week's issue we give an account of the completion of the details of organization. It will be seen in this account that the society proposes immediately to begin investigations on thought-transference. It is very necessary that this work should be in the hands of trusty investigators, and that they should have ample opportunity and means for carrying on their work. To some extent, they may find parties in private life who possess the alleged powers, but it may be necessary for them to call upon professionals; and, at any rate, it would be well if they were able to hire the professionals, and subject them to such experiments as would test their capacities. If there is a large proportion of fraud, one of the best works of the society would be to detect it, and publish it to the world; but this it cannot do, unless supplied freely with the necessary funds.

RECENT ADVANCES IN ELECTRICAL SCIENCE.

ELECTRICAL science has not made great strides during the year 1884; but in the direction of practical applications it is feeling the powerful aid of business ability and capital. The U. S. patent office is crowded with applications for patents on various electrical appliances. The scientific investigator must soon make a struggle for the free use of many old and familiar electrical appliances which he has known from boyhood, unless he, too, enters the field as an applicant for patents. The tendency of the times is certainly in the direction of obtaining patents in order to prove priority, even in the direction of pure science. We leave it to the moralist to decide the difference between a copyright for a literary man and a patent for a scientific man.

The problem of electric lighting is gradually yielding to the efforts of the great army of inventors. The Edison company has plants in almost all countries. The incandescent system has made its way on steamboats and steamships. The great Fall-River line of steamboats took the initiative in lighting the steamer Pilgrim, and has now extended the system to the other principal boats of the line. It is said, that, although the cost of lighting by incandescence is double that of gas, the better quality of light and the greater safety from fire counterbalance the increased cost. Experiments have been made by the Weston electric-light company during the year, upon long-filament incandescent lamps, which promise to give lamps approaching the candle-power of many arc-lights with a far pleasanter and steadier light.

Among the methods of electric lighting by incandescence, which have received renewed advocacy during the year, is the battery system. Trouvé's modification of the bichromate-of-potash battery consists in employing a very large proportion of sulphuric acid with bichromate of potash. An experience of three months with this battery will lead its most enthusiastic advocate to long for a cheaper source of electricity.

The problem of electric lighting is to find a cheaper motor than the steam-engine to drive the dynamo-electric engine, or to discover a more direct process of obtaining electricity from heat. No advance has been made this year in the generation of electricity by thermo-electricity. The meetings of the British association at Montreal, and the American association in Philadelphia, did not result in the production of many important papers on electricity; yet there is no doubt that many persons had their ideas clarified and their thoughts stimulated by these meetings. Perhaps the coming year will bear evidence of this. The electrical exposition in Philadelphia showed the great activity in the fields of electric lighting, and was chiefly interesting as an exhibition of various types of dynamo-machines.

The members of the electrical congress, also held in Philadelphia at the time of the electrical exposition, were inclined to dissent from the resolutions of the late Paris congress in regard to the adoption of a hundred and six centimetres of mercury, a millimetre in section, at the temperature of 0° C., as the legal ohm; since the work of Professor Rowland, it was believed, would give a closer value. Professor Rowland has not yet published; but it is believed that results have been obtained which will lead to a revision of the decision of the

Paris conference. The members of the conference also dissented from the conclusions of the Paris conference upon the adoption of the platinum standard of light; and a committee of the U. S. electrical conference is now engaged upon the study of a suitable standard. The suggestion by Siemens to use the light emitted by a square centimetre of platinum at the point of fusion, under the action of a known current of electricity, seems a fruitful one; and the committee is testing its capabilities.

In telegraphy and telephony, there is not much that is new to chronicle. It is perhaps a blow to our national pride to learn that we are behind England in the art of telegraphy, and that we are importing certain telegraphic instruments instead of exporting them.

The London central telegraphic office is certainly not approached in this country for completeness and system. There is a certain analogy between the action of the Irish settler in New England who burns up the fences and cuts down all the wood, and, in short, *skins* the farm, and the action of telegraphic and railroad corporations which run a system, but do not add to it as long as subsistence and dividends can be obtained. The American visitor to the London central office, however, can but be amused, that a separate room, with instruction, is provided for those operators who are to learn the reading of messages by sound. In America it was the operators who taught the superintendents that this method of receiving messages was preferable to the Morse register system.

We learn that the Bell telephone company has lately completed a special line between Boston and New York, and proposes to open telephonic communication between these cities. With the new powerful transmitters that have been and undoubtedly are to be invented, a great increase in the range of telephony is to be expected. Already most of the towns and principal cities throughout New England are connected by telephone-lines, to the great detriment of livery-stables and of stage-lines. The study of this new method of village-communication we leave to the political-economist. The system is destined to work great changes in manners and customs.

Unfortunately, the storage of electricity, so called, does not fulfil the extravagant hopes that were excited when Faure's battery burst upon the world. It is now found that the Planté battery is more practical than the Faure, and that, under careful methods of forming, it gives better results than the Faure and its various modifications. None of the storage-batteries now in use can be said to be commercial successes, for all of them deteriorate seriously in time. To the scientific investigator, however, they are extremely useful. One having a small electrical plant can charge his secondary batteries at his leisure, and thus have on *tap* a steady source of electricity. To the investigator who has ruined many suits of clothes with acid-batteries, and whose hands have almost ceased to be the insignia of gentle birth, the storage-battery is already a great boon.

Much has been said and written upon the subject of the transmission of power by electricity. It is proposed to try different systems upon a certain portion of the elevated railways of New York. Nothing but an experiment upon a sufficiently large scale, under intelligent scientific supervision, can determine whether the electrical transmission of power can compete successfully with the use of the locomotive on public exposed highways. There is a future for this system in many ways, even if it fails on railways. The year, however, has added little to our knowledge of it.

The subject of underground wires has been much agitated lately, and the Western union telegraph company has lately tried the experiment of placing many of its lines between two distant points in Boston under ground. At present they work successfully; but time is needed to show that a suitable degree of insulation can be maintained in this frost-afflicted climate.

The scientific theory of electricity has not received notable accessions during the year. The U. S. signal-service has established stations for the study of atmospheric electricity at Baltimore and at Cambridge. It is believed that electrical observations will give additional data for foretelling the approach of storms. The subject of atmospheric electricity is still shrouded in mystery; and little more is known than that there is a difference of electrical level between the earth and the air, and that this difference undergoes modifications, and that we have methods of measuring these modifications. Little progress has been made in our knowledge of the connection between earth-currents and changes in the electrical potential of the air. It is maintained by Mr. Blavier, who has had several experimental telegraph-lines under his direction in France for the study of earth-currents, that changes in the potential of the air cause very small changes in the character of earth-currents, and that the latter have a real and separate existence.

Lord Rayleigh has been engaged upon a study of the silver voltameter and its application to the measurement of electrical currents. He finds that one ampère deposits four grams of silver per hour, and a sufficient amount can therefore be obtained for accurate weighing in fifteen minutes. Pure nitrate or chlorate of silver gives the best results. Beetz has proposed a new form of Daniell cell, of great internal resistance. Fine alabaster plaster-of-Paris is mixed with concentrated sulphate-of-copper solution, and the copper electrode is fixed in this at one end of a glass tube: the rest of the tube is filled with concentrated sulphate of zinc and plaster-of-Paris, and the zinc electrode is also embedded in this. The ends of the tube are filled with paraffine. This form of cell has been tried at the Jefferson physical laboratory of Harvard university, and has been found an excellent substitute for the water-cell of zinc and copper for charging electrometers.

The lull in the progress of theoretical electricity is probably the precursor of important additions to our knowledge; for many investigators are at work, both at home and abroad, testing the new electrodynamic theory of light, and adding to our knowledge of magnetism. The equipment of physical laboratories in America, which has been one of the features of the year at Cambridge as well as elsewhere in America, bids us hope for much systematic study of the science of electricity, and physical science in general. JOHN TROWBRIDGE.

CO-ORDINATION OF THE SCIENTIFIC BUREAUS OF THE GOVERNMENT.[1]

THE land-maps of European countries are, as a rule, made under the direction of the war departments of those countries, and under the direction of officers of the army specially detailed for that duty, with the aid of experts in the business and in the arts necessary to the surveys and to the production of the charts, who are employed from civil life, and also of enlisted soldiers and non-commissioned officers detailed from the army.

For details on this subject, the committee refers to the printed notes on European surveys compiled and published in 1876, under the direction of one of its members, Gen. C. B. Comstock, U. S. engineers, as the most complete compendium on this subject known to them; also to some manuscript notes prepared by the committee from reports and publications of later date.

[1] Extracts from the report of a committee of the National academy of sciences, consisting of Gen. MEIGS, and Professors J. P. TROWBRIDGE, PICKERING, YOUNG, WALKER, and LANGLEY.

The hydrographic surveys of the coasts of Europe appear in every country to be the work of the naval establishment. On the coasts of the United Kingdom the hydrography has been completed; and now two parties in surveying vessels of the navy are constantly employed in re-sounding and examining channels, harbors, and shoals, in order to correct the existing admiralty charts. All this is done under direction of the admiralty.

While the organization of the land and of the hydrographic surveys in Europe are very perfect, your committee does not find that they offer any thing to improve that of the United States, except, perhaps, in showing the economy in time and money of greater use of photography and of zincography in the reduction and production of maps and charts. In Great Britain now the twenty-five-inch-to-the-mile map is published even earlier than those on smaller scales, all of which are reductions from the original manuscript maps surveyed and plotted on the twenty-five-inch or six-inch scale.

Early and cheap publications of results of operations in the field, if they retain the accuracy of the original maps, are of great industrial and economic importance. The English maps of the ordnance survey are published and placed on sale as soon as printed, and at very moderate prices.

Your committee would call attention, in this connection, to the report made by the National academy of sciences to congress in December, 1878, in which the advantages of a consolidation of the then existing surveys were pointed out. In that report, it was recommended that surveys should be two in number, — the coast and interior survey, to be concerned with the triangulation and mapping of the country and its topography; and a geological survey, to undertake geological and economical investigations. It would be a part of the duty of the former survey to supply the maps for the use of the geological survey; and, in order to secure the co-ordination and harmonious co-operation of the two surveys, it was recommended that the coast and interior survey be transferred to the interior department.

Congress adopted so much of this recommendation as related to the formation of a single geological survey, but did not provide for the proposed transfer of the coast-survey, nor make any other provision for the topographic work necessary for the geological survey. The result has been that these two surveys do not co-operate as they should. The chief of the geological survey has also found it necessary to employ large corps of men in trigonometric measurements.

Your committee does not feel entire confidence that the union of these two surveys under either one of the executive departments, would, without other measures, necessarily lead to that unity of work which is desirable. It therefore recommends certain further legislative measures, the occasion for which will be made clear by a review of the work done by these several organizations; but its members are entirely clear in the opinion that some one of the executive departments should control both. It is for